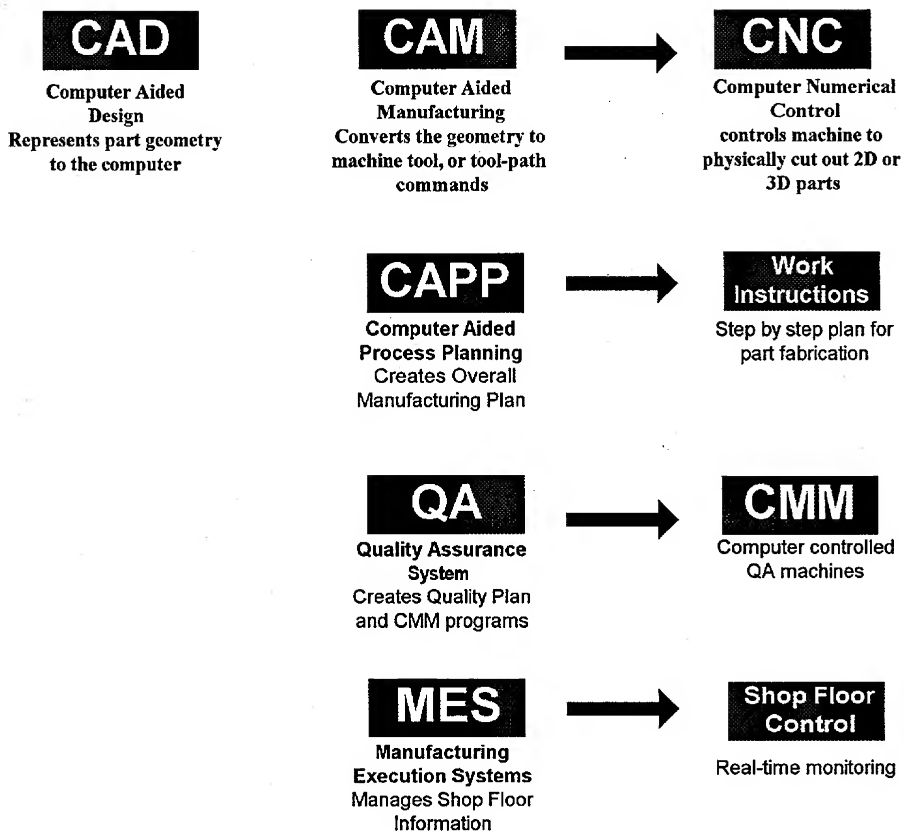

Fig. 1 (Prior ART)

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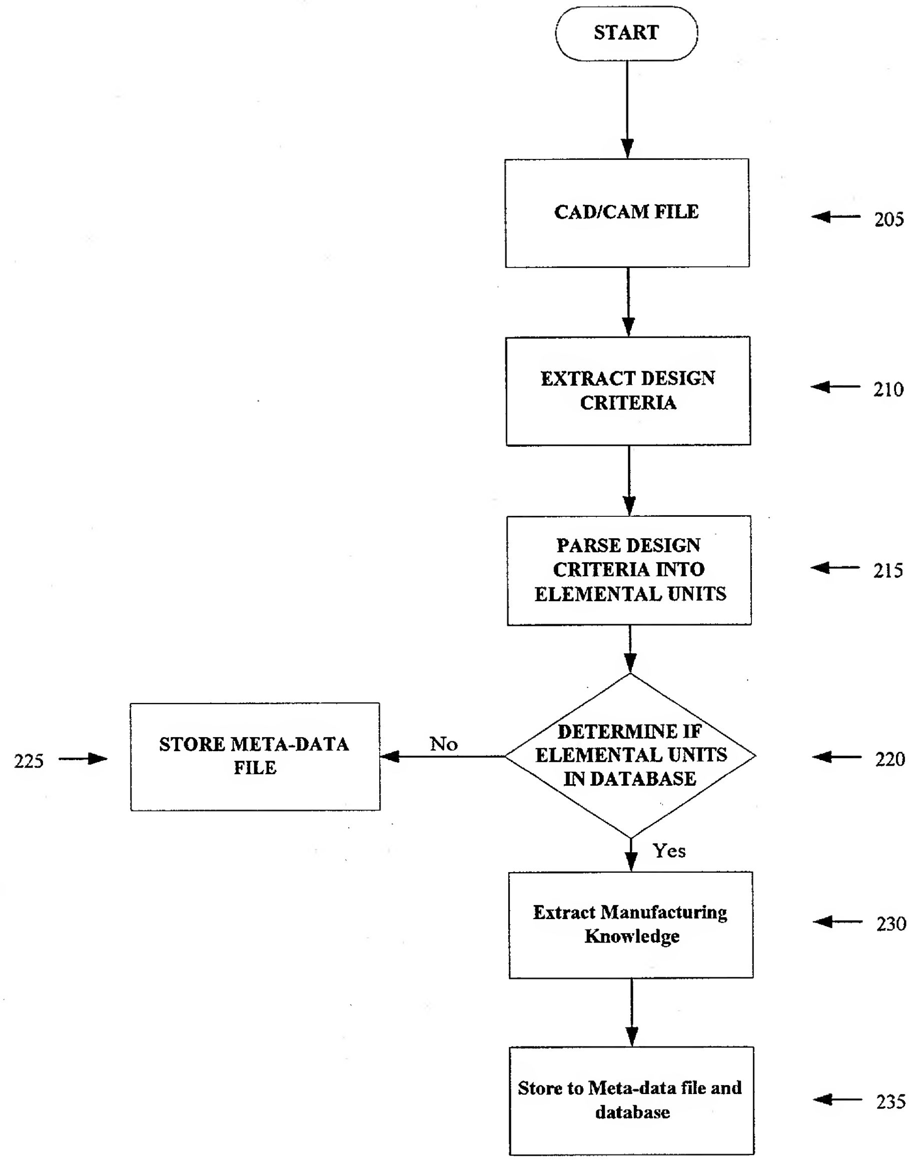

Fig. 2

10063802.051402

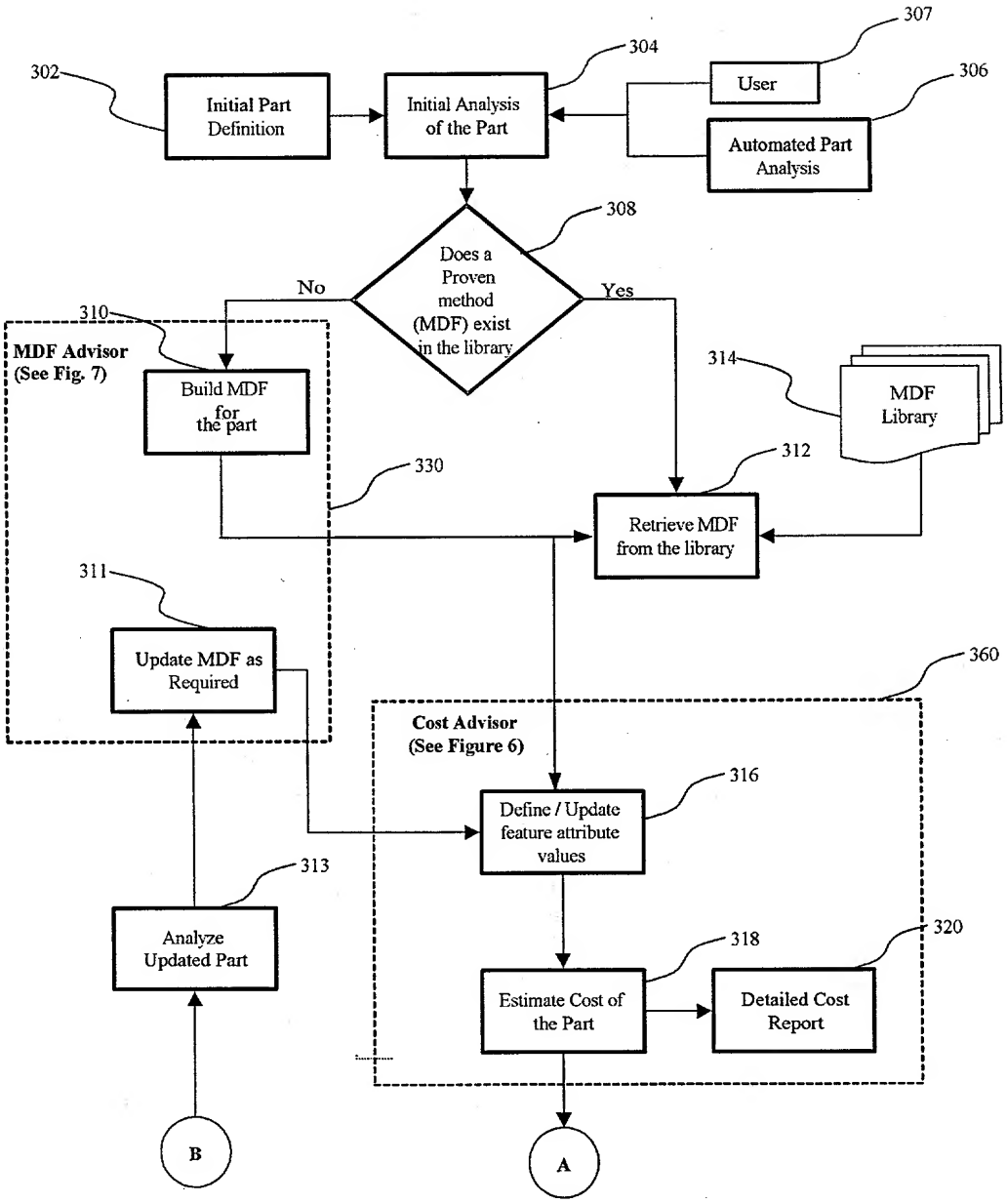
302
Initial Part Definition
304
Initial Analysis of the Part
307
User
306
Automated Part Analysis
308
Does a Proven method (MDF) exist in the library
No
Yes
310
MDF Advisor (See Fig. 7)
Build MDF for the part
314
MDF Library
330
312
Retrieve MDF from the library
311
Update MDF as Required
360
Cost Advisor (See Figure 6)
316
Define / Update feature attribute values
313
Analyze Updated Part
318
320
Estimate Cost of the Part
Detailed Cost Report
B
A

Fig. 3

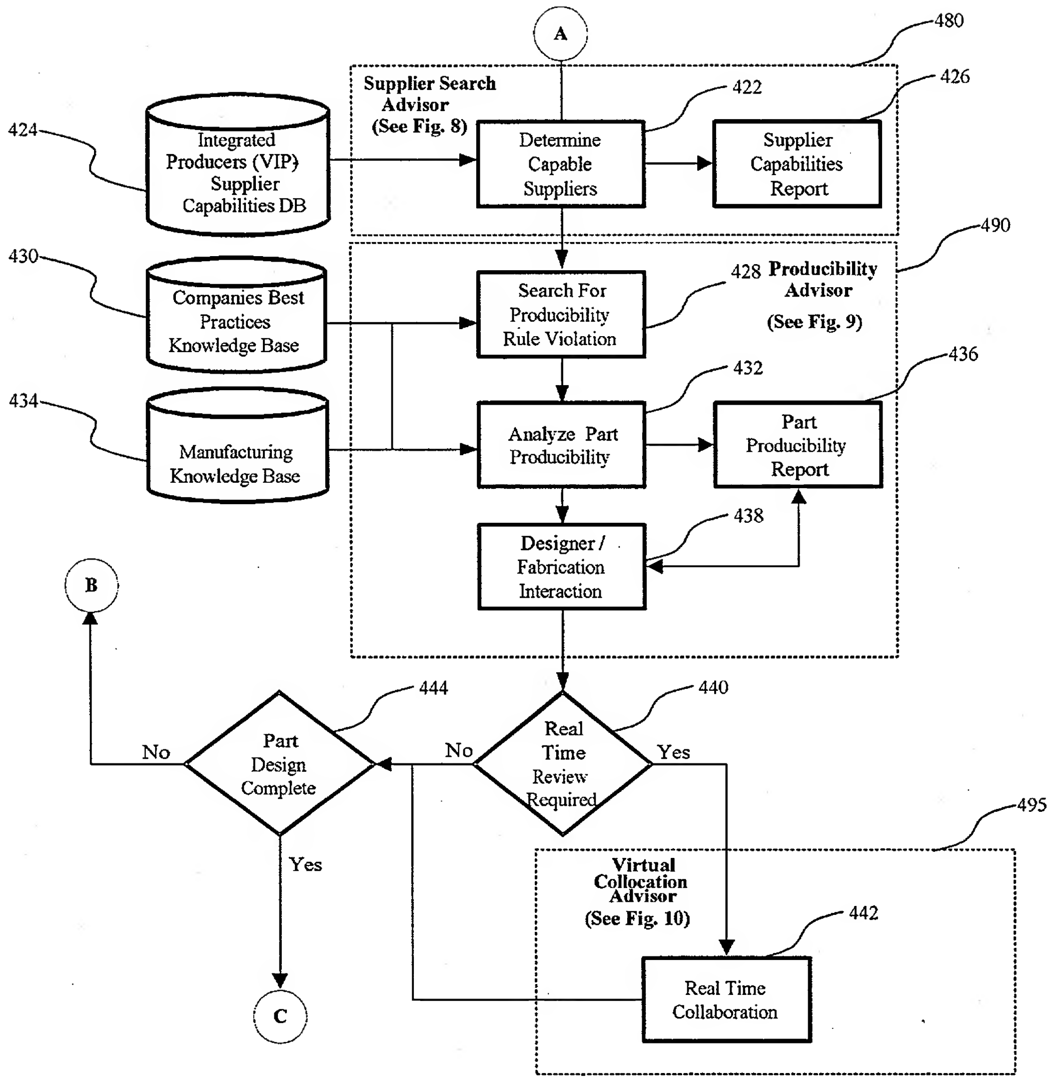

Fig. 4

10063802.051402

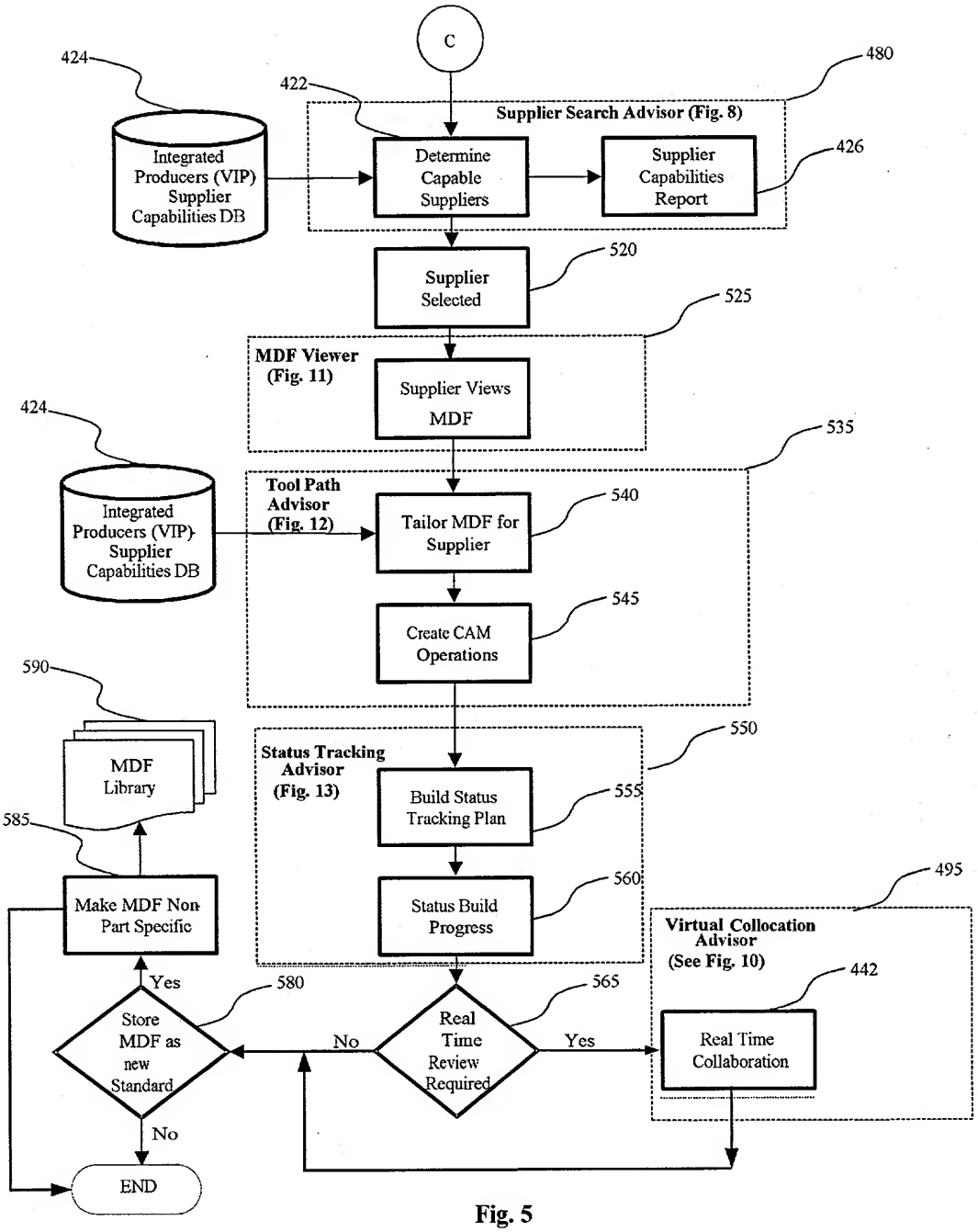
C
424
422
480
Supplier Search Advisor (Fig. 8)
Integrated Producers (VIP) Supplier Capabilities DB
Determine Capable Suppliers
Supplier Capabilities Report
426
Supplier Selected
520
525
MDF Viewer (Fig. 11)
Supplier Views MDF
424
535
Tool Path Advisor (Fig. 12)
Integrated Producers (VIP) Supplier Capabilities DB
Tailor MDF for Supplier
540
Create CAM Operations
545
590
MDF Library
550
Status Tracking Advisor (Fig. 13)
Build Status Tracking Plan
555
585
Make MDF Non Part Specific
Status Build Progress
560
495
Virtual Collocation Advisor (See Fig. 10)
Yes
580
565
442
Store MDF as new Standard
No
Real Time Review Required
Yes
Real Time Collaboration
No
END

Fig. 5

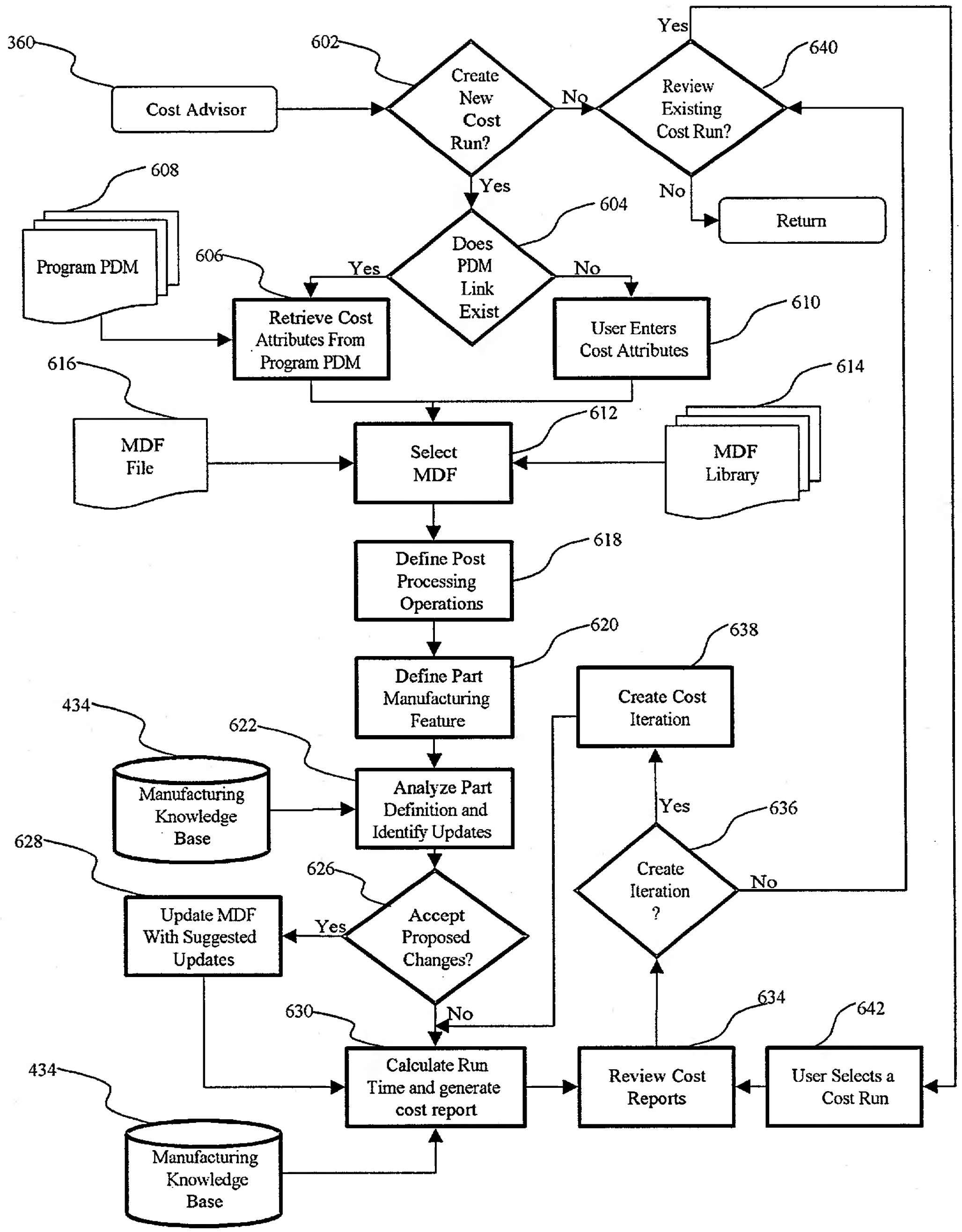

Fig. 6

10063802.051402

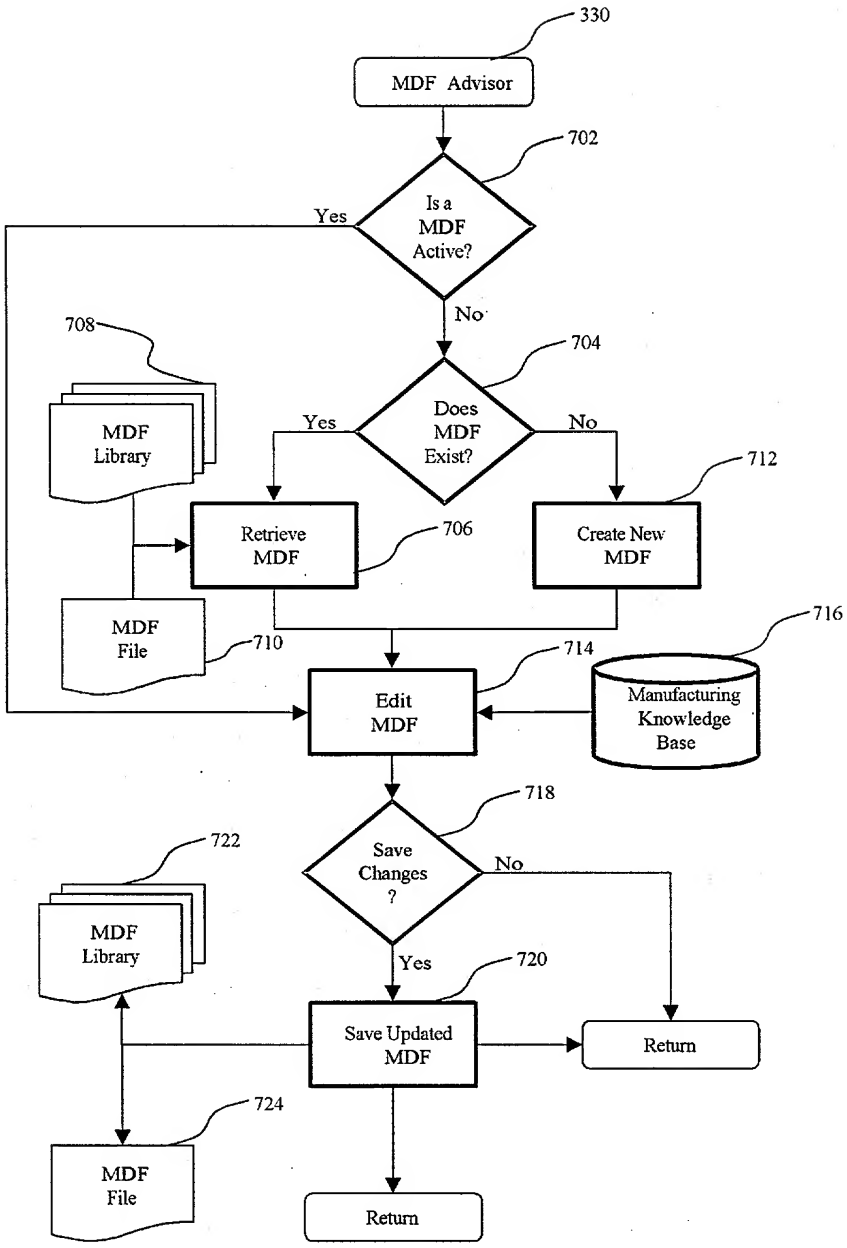

Fig. 7

Doc Code: AP.PRE.REQ

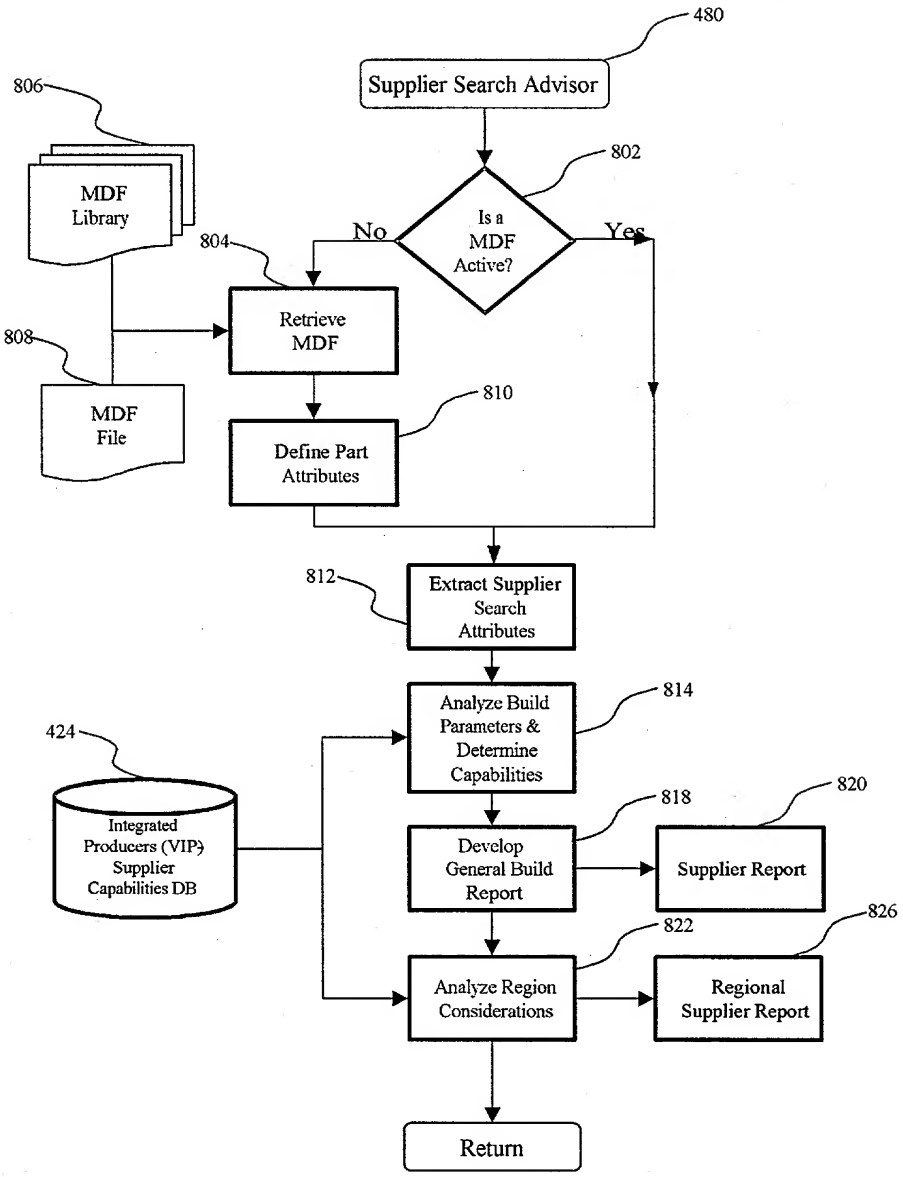

Fig. 8

Electronic Patent Application Fee Transmittal

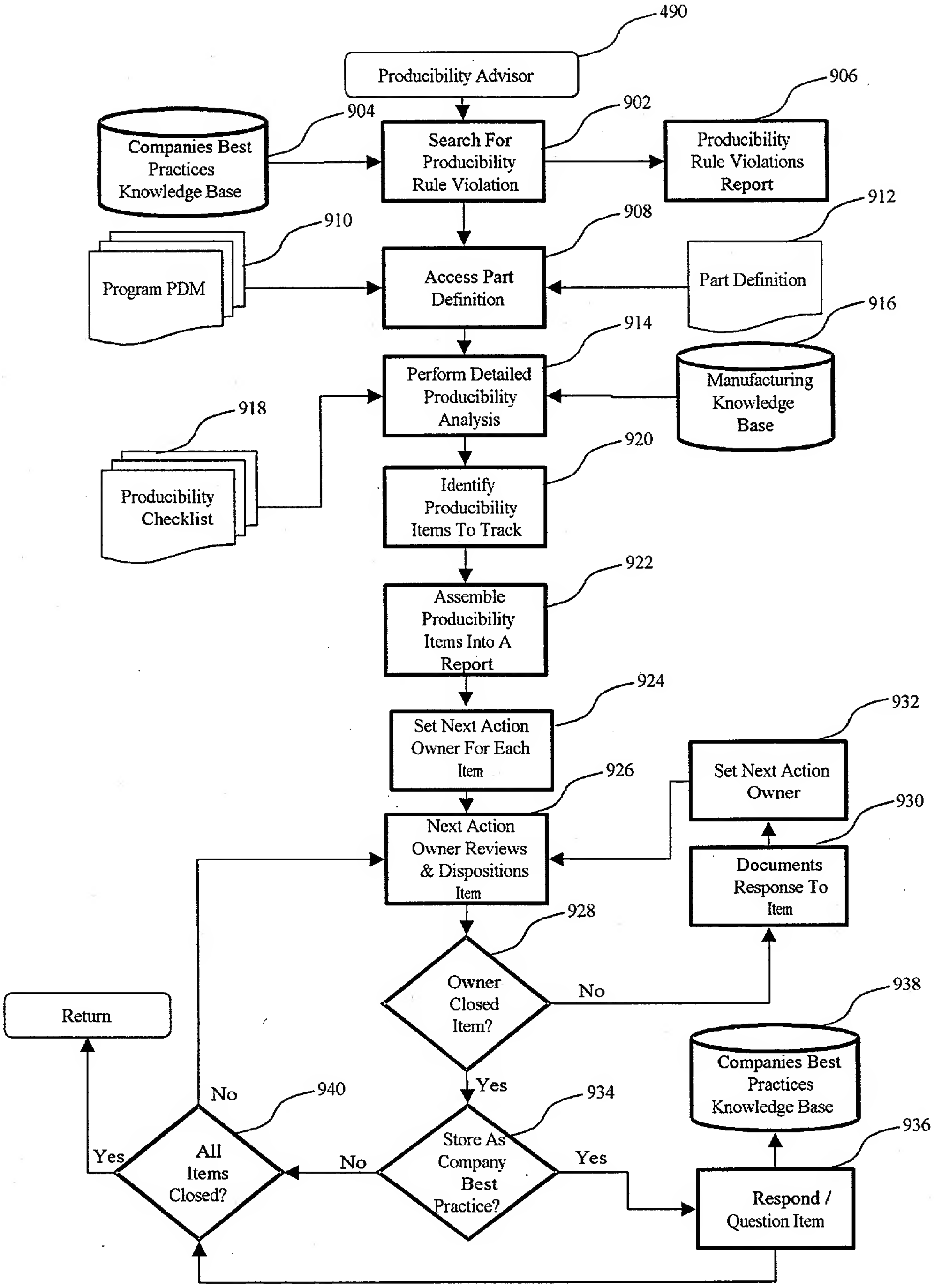

Fig. 9

10063802.052402

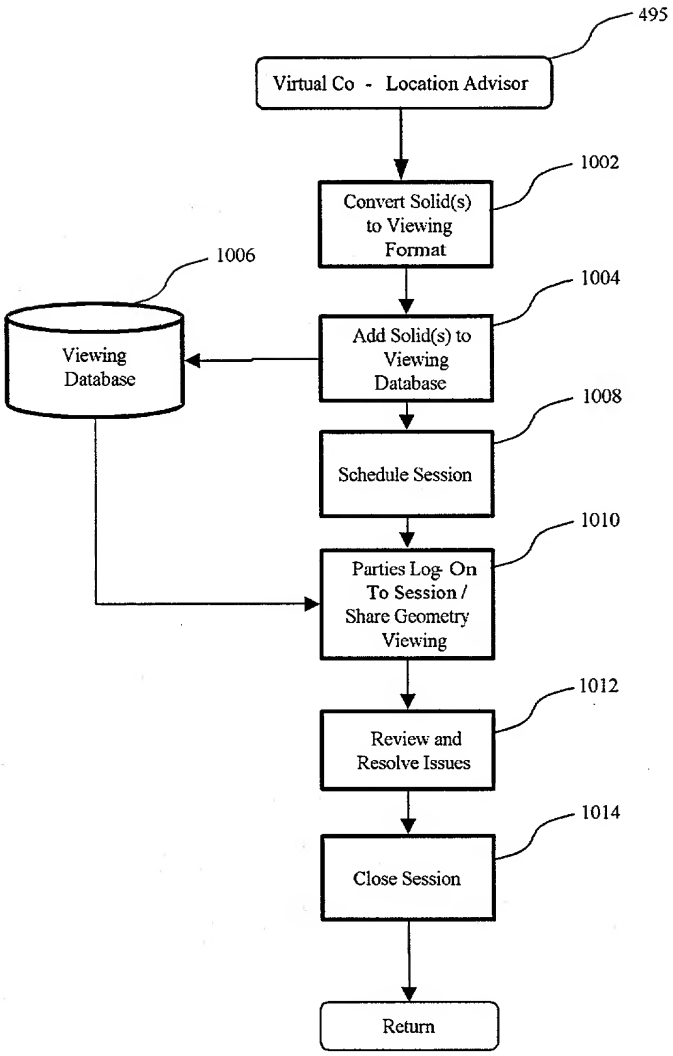

Fig. 10

US 2005/0256607 A1

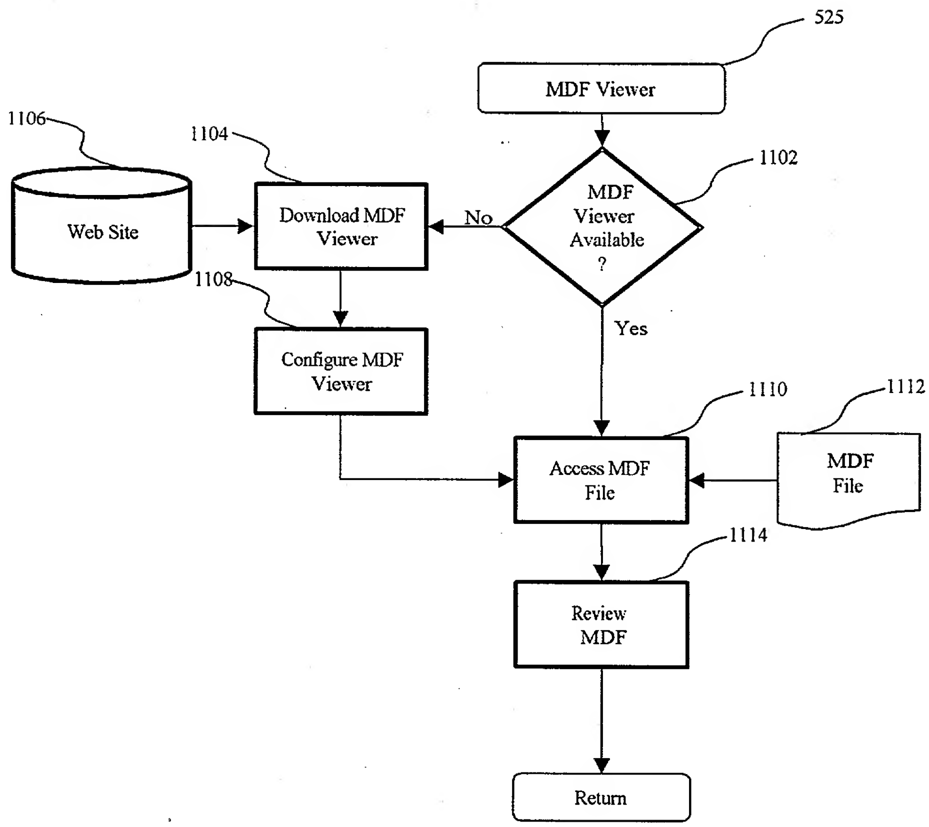

Fig. 11

10063802 .051402

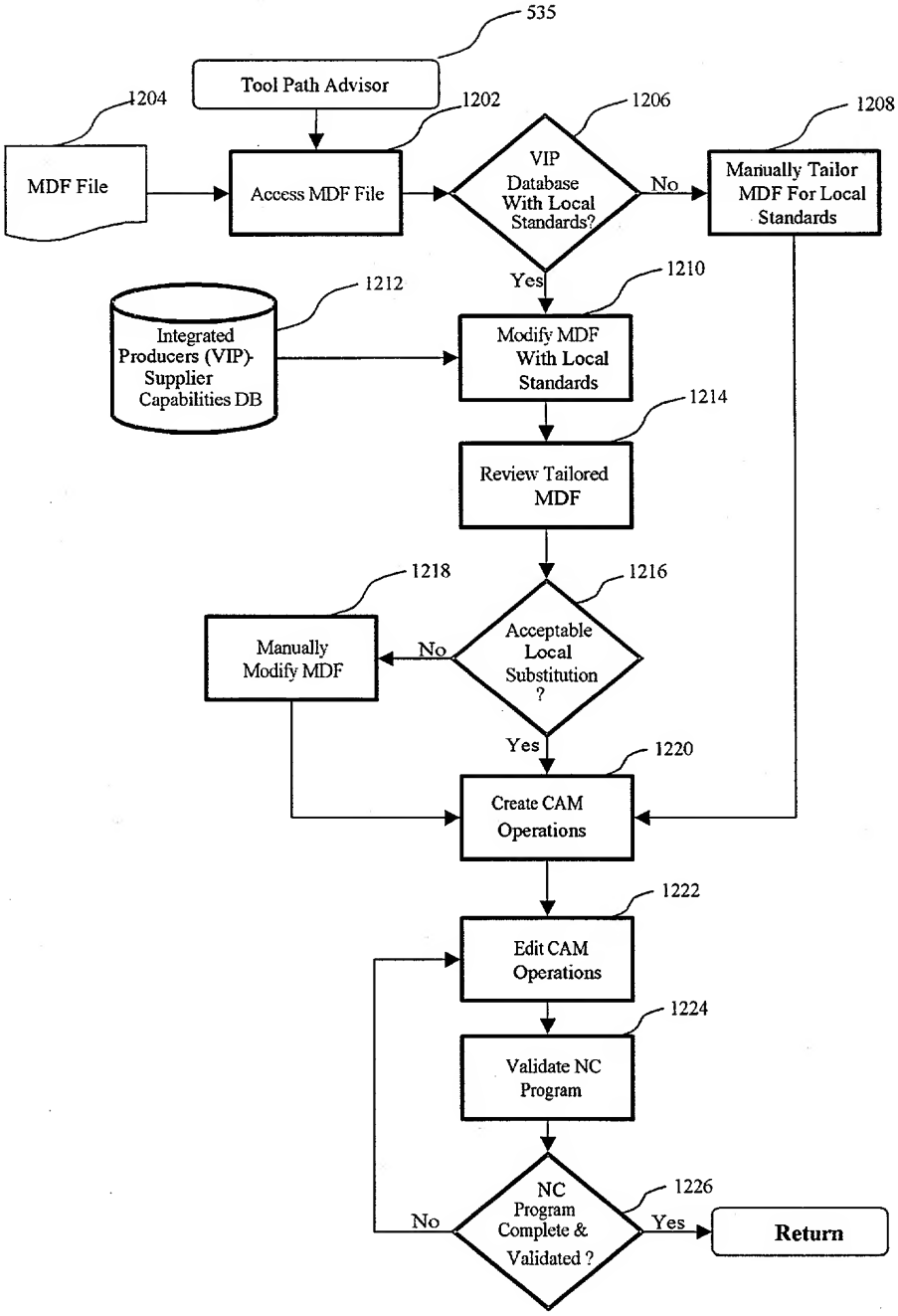

Fig. 12

Doc Code: AP.PRE.REQ

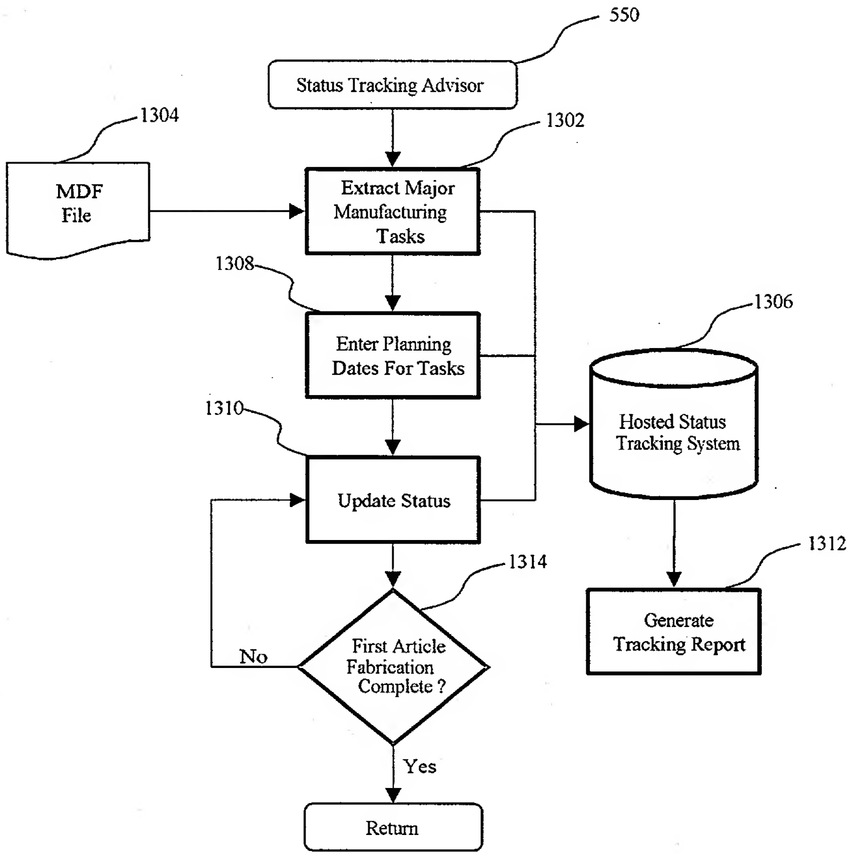

Fig. 13

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MDF – Manual Operation Section

Attribute	Data Type	Description
Manual Operation Description	Text	User entered text describing the manual operation
Manual Operation Name	Text	User entered name for the operation
Manual Operation Identification Number	Real	Internal identification numbe r
Manual Operation Type	List	Manual Machining, Stock Preparation, Machine Setup,...
Manual Operation Planned Start Date	Date	Planned start date
Manual Operation Actual Start Date	Date	Actual start date
Manual Operation Planned Completion Date	Date	Planne d completion date
Manual Operation Actual Completion Date	Date	Actual completion date
Current Percentage Complete	Real	Between 0 - 100% to indicate current status
Schedule Status Description	Text	User text field for current part status

Fig. 14

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MDF – QA Section

Attribute	Data Type	Description
QA Section Description	Text	User entered text describing the manual operation
QA Section Owner	Text	Assigned owner of the QA section
QA Section Version	Text	Version number for the QA section, including the management of past version to track history
QA Section Version Description	Real	Description of the version, managed with the version number
QA Section Version Date	Date	Date the new version was created
QA Section Identification Number	Real	Tracking number for the QA Section
QA Section Name	Text	User assigned name for the section
QA Method	List	Manual / CMM / On - machine
Probe Type	List	TBD
Probe Identification Number	Real	Internal tracking number for the probe
Probe Manufacturer	Text	Name of the firm that manuf actures the probe
Probe Reference Number	Real	Manufactures identification number for the probe
Inspection Criteria	Text	Description of inspection point location and matrix requirements
Number of Inspection Points	Integer	Number of inspection points in this QA Section
Feature Group	Text	The names of the features that the QA Section os addressing
QA Section Planned Start Date	Date	Planned start date
QA Section Actual Start Date	Date	Actual start date
QA Section Planned Completion Date	Date	Planned c ompletion date
QA Section Actual Completion Date	Date	Actual completion date
Current Percentage Complete	Real	Between 0 - 100% to indicate current status
Schedule Status Description	Text	User text field for current part status

Fig. 15

10063802.051402

MDF – NC Setup Section

Attribute	Data Type	Description
NC Setup Description	Text	User text entry describing the entire NC setup
NC Setup Owner	Text	Assigned owner of the setup
NC Setup Version	Real	Version number for the setup, including the management of past version to tr ack history
NC Setup Version Description	Text	Description of the version, managed with the version number
NC Setup Version Date	Date	The date the new version was created
NC Setup Identification Number	Real	Tracking number for the setup
NC Setup Name	Text	User defined name of setup
NC Setup Type	List	Rough, finish, rough/finish
NC Setup Description	Text	Text by the user describing the setup
Machine Identifier	Text	i.e. "North End Gantry Group"
Machine Group Identifier	Text	Machine 37
Machine Manuf acture	Text	Name of machine tool manufacture
Machine Type	List	Gantry, Rotary Table, Extrusion Mill...
Spindle Orientation	List	Horizontal / Vertical
Machine Controller	Text	Controller manufacture
Machine Specification – Spindle Speed	Real	Required or maximum spindle speed
Machine Specification – Machine Envelope – X	Real	X dimension of the machine envelope
Machine Specification – Machine Envelope – Y	Real	Y dimension of the machine envelope
Machine Specification – Machine Envelope – Z	Real	Z dimensi on of the machine envelope
Machine Specification – Horse Power	Real	Required or maximum horse power
Machine Specification – Positional Tolerance	Real	Required or actual positional tolerance of the machine
Machine Specification Positional Tolerance Dis tance	Tol / Dist.	The distance from the home position that the positional tolerance is appropriate
Machine Specification – Axis Rotation in A	Real	The machines "A axis" rotation capability from normal possible for the machine.
Machine Specification – A xis Rotation in B	Real	The machines "B axis" rotation capability from normal possible for the machine.
Machine Specification – Axis Rotation in C	Real	The machines "C axis" rotation capability from normal possible for the machine.
Machine Specification – Machine Home	Point	The machines "home" location
Machine Specification – Tool Change Position	Point	The x,y,z, location of the machine where tool changes take place
Machine Specification – Tool Change Orientation	Real	The orientation of the machine durin g a tool change
Machine Specification – Start Sequence	Text	Machine unique commands necessary for machine start
Machine Specification – End Sequence	Text	Machine unique commands necessary for machine stop
Machine Specification – Tool Change Requirement Sequence	Text	Machine unique commands necessary for tool change sequences
Machine Specification – Tool Management Type	List	Manual, Tool Chain
Machine Specification – Number of Spindles	Integer	Number of spindle active on the machine
Machine Specific ation – Tool Chain Pockets	Integer	Number of pockets in the tool chain
Tool Chain Cutter Assembly Management	Array	Definition of which cutting tool assigned within the entire NC Operation Section are in which pocket of the tool chain
NC Setup Planned S tart Date	Date	Planned start date
NC Setup Actual Start Date	Date	Actual start date
NC Setup Planned Completion Date	Date	Planned completion date
NC Setup Actual Completion Date	Date	Actual completion date

Fig. 16

MDF – Post Operation Section

Attribute	Data Type	Description
Post Operation Description	Text	User entered text describing the Post Operation
Post Operation Owner	Text	Assigned owner of the Post Operation Section
Post Operation Version	Real	Version number for the Post Operation Section, including the management of past version to track history
Post Operation Version Description	Text	Description of the version, managed with the version number
Post Operation Version Date	Date	The date the version was created
Post Operation Identification Number	Real	Tracking number for the Post Operation Section
Post Operation Name	Text	User assigned name for the section
Post Operation Type	List	Heat Treat / Chemical Processing / Plating...
Post Operation Sub Type	List	Dependant on Type
Post Operation Specification	Text	
Masking Required	Boolean	Is masking required for a post process
Masking Type	Text	The type of masking required
Masking Percentage	Real	The Percentage of the part to be masked
Post Operation Planned Start Date	Date	Planned start date
Post Operation Actual Start Date	Date	Actual start date
Post Operation Planned Completion Date	Date	Planned completion date
Post Operation Actual Completion Date	Date	Actual completion date
Current Percentage Complete	Real	Between 0 - 100% to indicate current status
Schedule Status Description	Text	User text field for current part status

Fig. 17

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Attribute	Data Type	Description
Cutting Assembly Description	Text	User entered text describing the Post Operation
Cutting Tool Identifier	Text	Site specific tracking id of the tool assembly
Cutting Tool Definition Name	Text	Name of the cutting tool assembly
Cutting Tool Manufacturer	Text	Name of the cutting tool manufacture
Manufacturers Reference Number	Text	Manufactures reference number
Type of Cutting Tool	List	End Mill / Drill / Face Mill / Plunge Mill /...
Holder Type	Text	General type of the holder (e.g. CAT or DIN)
Holder Taper	Real	Degree of taper in the holder
Holder Identifier	Text	Tracking number for the holder
Cutting Tool Assembly Identifier	Text	Identifier for the entire cutting tool assembly
Cutting Tool Assembly Name	Text	Name of the entire cutting tool assembly
Special Cutter	Boolean	Yes / No
Special Cutter Cross Section	Array	2-d cross section of the special cutter
Cutting Tool Diameter	Real	Diameter of cutting tool (if applicable)
Cutting Tool Corner Radius	Real	Radius of the cutting tool (if applicable)
Cutting Tool Number of Flutes	Integer	Number of flutes in the cutting tool (if applicable)
Cutting Tool Alpha Angle	Real	Alpha angle for the cutter
Cutting Tool Beta Angle	Real	Beta angle for the cutter
Cutting Tool Shank Diameter	Real	Diameter of the cutter shank
Cutting Tool Set Length	Real	Length of the tool stickout
Cutting Tool Flute Length	Real	Length of the cutter that can be utilized in a cutting action
Cutting Tool Coating	List	Type of coating applied to the cutter
Insertable Cutting Tool	Boolean	Is the cutter an insertable cutter or not – Yes / No
Insertable Cutting Tool Type	List	Monolithic, Manual
Insert Identifier	Text	Tracking number for the insert type
Insert Name	Text	Name of the insert
Insert Manufacture	Text	Manufacture of the insert
Tool Stick-out	Real	Distance from the tool tip to the start of the holder
Base Feed Rate	Real	Federate standard for the cutting tool assembly (this can be overridden either higher or lower within each NC action)
Base Spindle Speed	Real	Spindle speed standard for the cutting tool assembly (this can be overridden either higher or lower within each NC action)

Fig. 18

MDF – NC Action

Attribute	Data Type	Description
Description	Text	User entered text describing the Post Operation
NC Action Identifier	Text	Internal tracking number of the NC Action
NC Action Name	Text	User assigned name of the NC Action
Operation Type	List	Extruded V olume, Cylinder Volume, Void Volume, Swept Volume, Offset Volume
Feature Group	Text	Name of the feature group associated with the NC action
Feature Type	List	Type of feature in the feature group
Action Type	List	Rough, Finish Floor, Finish Walls,
CA M Operation Identifier	Real	Pointer to CAM operation
Feedrate Override Percentage	Percentage	Percentage to override the base federate for the cutting assembly
Spindle Speed Override	Percentage	Percentage to override the base spindle speed for the cuttin g assembly
Depth of Cut	Real	Depth of each cut level
Wall Offset	Real	Offset from the wall for an NC operation (or amount of material left on the wall after the operation is complete)
Floor Offset	Real	Offset from the floor for an NC operation (or amoun t of material left on the floor after the operation is complete)
Corner Slow Down	Boolean	Flag to indicate whether to slow down during corner cutting
Corner Slow Down Percentage	Percentage	The percentage to slow the federate in the corner
Level Transiti on Type	List	Plunge, Ramp, Helical, Pre -drill
Toolpath Type	List	Helical, Back -and- Forth, One -Way
Cutting Type	List	Climb or Conventional

Fig. 19

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MDF – QA Action

Attribute	Data Type	Description
Description	Text	User entered text describing the Post Operation
QA Action Identification Number	Real	Internal tracking number of the QA Action
QA Action Name	Text	User assigned name of the QA Action
QA Operation Type	List	Manual / Machine Probing
Feature Group	Text	Name of the feature group associated with the QA action
Feature Type	List	Type of feature in the feature group
Action Type	List	Rough, Finish Floor, Finish Walls,
CAM Operation Identifier	Real	Pointe r to QA Operation

Fig. 20

EFS ID: 2054762

Example MDF Structure

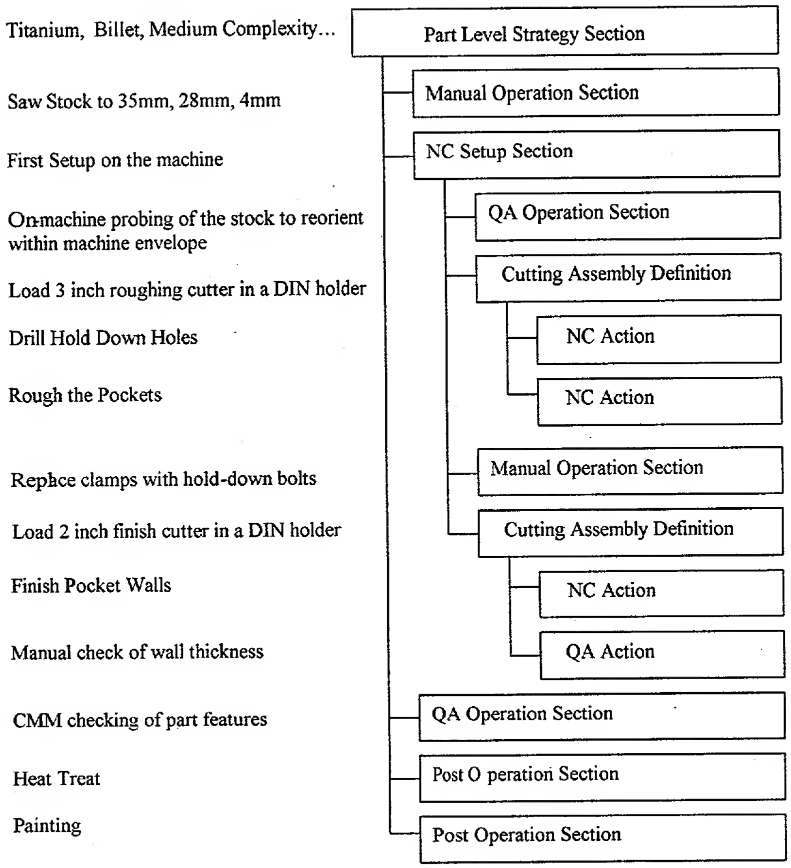

Fig. 21

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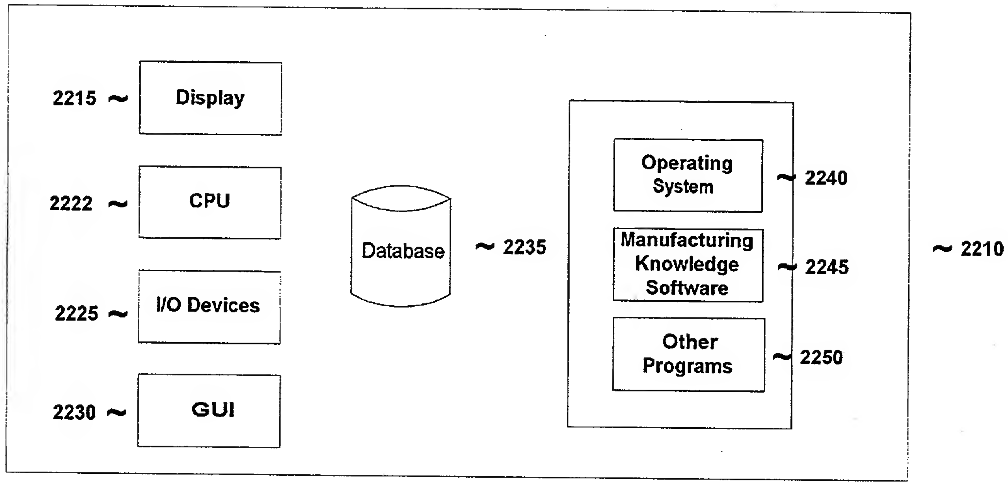

Fig. 22

10063802.052402